

Course Curriculum of the PG. Dip. (ICT)

Courses offered by IICT

Core Courses:

ICT 5100 Project

6.00 credit, 12 hours/week

Study of practical problems in the field of Information and Communication Technology (ICT).

ICT 5101 Programming Concepts

3 credits, 3 hours/week

Introduction to programming and logic flow, procedural versus object oriented programming, data types, variables, constants, operators, expressions, input-output, control structures, arrays, functions, pointers, file access, structures, dynamic memory allocation, classes, objects, constructor and destructor, inheritance, polymorphism, files, exception handling..

ICT 5102 Data Structure and Algorithm

3 credits, 3 hours/week

Introduction to elementary data structures: arrays, records, linked lists, stacks, queues, trees; Complexity analysis of algorithms; Basic search and traversal techniques; Sorting algorithms; Methods for the design of efficient algorithms: recursion, divide and conquer, greedy method, dynamic programming; Graph algorithms.

ICT 5103 Database Design and Management

3 credits, 3 hours/week

Introduction to database; Relational model: structure, relational algebra, SQL and advanced SQL, Database design and the entity-relationship model, Relational database design and normalization, application design and development, indexing, Database storage and file structure, transaction management, concurrency control recovery management, object database and database administration.

ICT 5104 Introduction to Telecommunications
3 credits, 3 hours/week

Overview of telecommunication: history, evolution, convergence of telecommunication and data networks, standards; Basics of communication systems: modulation, multiplexing; Switching system: circuit switching, packet switching; Voice over Internet Protocol (VoIP), Fax over IP network, voice over frame relay, and ATM; Telephony: operating principles, telephone apparatus, description of the modern phone; Telephone switching systems: PBX, Centrex, ACDs, call centers, computer integration; Data communication equipment: introduction to terminals, modems, RS-232 and other interfaces, modem types; Tele-Traffic analysis; Cellular telephony: Frequency reuse, frequency management, channel alignment, handoffs strategies, FDMA, TDMA, CDMA and GSM, Introduction to satellite communication, Optical fibre communication, Submarine cables, Digital Radio Microwave, etc.

ICT 5105 Data Communications
3 credits, 3 hours/week

Introduction to data communication and networks; transmission media, signals, noises, modulation and demodulation, synchronous and asynchronous transmission, line encoding, error detection and correction, RS 232 interface, HDLC, flow control and error control; Channel multiplexing; Data network: point to point connections, circuit-switched, message switched and packet switched networks, WANs, ISPs and LANs, differences in ownership, speed and cost; Types of communication: client server communication, broadcast, unicast and multicast modes, simplex, duplex and half duplex information flow; Bandwidth: distribution of bandwidth, discrete bandwidth requirements, implications of other factors; Internet, OSI reference model, TCP/IP reference model, TCP/IP architecture

ICT 5106 Computer Networks
3 credits, 3 hours/week

Overview of LAN concepts, media, collision and broadcast; MAC address; Token ring, Fiber Distributed Data Interface (FDDI), Ethernet and Carrier Sense Multiple Access Collision Detect (CSMA/CD), IEEE 802.3., LAN topology; Network layer: internetworking, routing, IPv4 and IPv6 addressing, subnetting, VLSM, NATPAT, ACL, ARP and RARP, DHCP, RIP, IGRP and EIGRP, OSPF; Upper layers of OSI model; Wireless LAN: Ad hoc, infrastructure networks; WAN services: analog dial-up, ISDN dial-up, dedicated leased line, X.25, frame relay, ATM; IEEE802.11: physical layer, framing, multiple access techniques, blue-tooth, IEEE 802.15; Broadband wireless: Wireless ATM, 802.16; local multipoint distribution service (LMDS), Multichannel

Multipoint Distribution System (MMDS); Network protocols: mobile IP, cellular IP, mobile Ad hoc networking.

ICT 5201 Operating System Concepts
3 credits, 3 hours/week

Overview of operating system and its role in computer systems; Process: process model, inter-process communication; thread model; CPU scheduling; Memory management, virtual memory, address translation; File systems: files, directories, protection and security; Input, output; Deadlock; Introduction to UNIX, UNIX kernel, UNIX commands, services, device structure, memory structure, process and jobs, file system and file management, vi and emacs editors, shell programming; LINUX: user management, privilege, using rpm, using configuration files.

ICT 5202 Visual Programming
3 credits, 3 hours/week

Concepts of visual programming; Data types, variables and expressions, control structures; Classes and objects, constructors; Inheritance, packages and interfaces; Exception handling; Collection classes: array, vector; Threads; GUI development; applets; Graphics and multimedia; Servlet; JDBC; Java beans; Java server page; Java networking.

ICT 5203 Web Technologies, Protocols, and Applications
3 credits, 3 hours/week

Web architecture and HTTP: history and architecture of the World Wide Web, overview of the Hyper Text Transfer Protocol, other related protocols; Hyper Text Mark Language (HTML): concept of markup, overview of HTML (table, form, frame, window, link etc.); Client side scripting: variables data types, control structure, functions, Document Object Model (DOC), event handlers, properties methods, cookies; Server side scripting: concepts, variables, data types, control structure, functions, objects; Database: content generation, data exchange; Regular expressions, mails, cookies, sessions; Middleware: object management architecture, object request brokers (CORBA, OLE/COM), services (trading, naming, event, transaction, security), interorb protocols (e.g. the Internet Interorb protocol).

ICT 5204 Multimedia Design and Development
3 credits, 3 hours/week

Introduction to multimedia, image, sound, video formats and their different properties, compression, playing and recording techniques, merits and demerits, conversions between different formats and their combinations; Multimedia authoring, introduction to web and HTML, basic HTML tags design principles; Drawing: basic image properties, image manipulation, layers, colors, text, texture, brightness, contrast, filters and effects; Interactive application development using multimedia tools.

ICT 5205 Client Server Technologies
3 credits, 3 hours/week

Introduction, components of client server architecture, middleware, socket, Remote Procedure Call (RPC), Distributed Computing Environment (DCE), Common Object Request Broker Architecture (CORBA), Java Remote Method Invocation (RMI), Enterprise Java Beans (EJB), distributed data management, client-server application development, storage management, security and user management, backup and recovery, performance tuning.

ICT 5206 Electronic Commerce
3 credits, 3 hours/week

Overview of electronic commerce, business models; E-commerce channels: portals, auctions, communities, marketplace; Managing the marketplace: Demographics and advertising; Customer relationship management, web services for B2B and B2C e-commerce, electronic payment systems; Network security, cryptography, digital certificates; Markup for e-commerce: ebXML, M-commerce, L-commerce, wireless and U-commerce, digital money and electronic banking; Ethical, legal, and regulatory environment: Intellectual property, copyright, trademark, patents.

ICT 5207 Information System Analysis and Design
3 credits, 3 hours/week

Different types of information systems, attributes of information, roles, tasks and attributes of a system analyst, sources of information, information gathering techniques, handling of missing information, steps of system analysis, different types of feasibility analysis; Design of an information system: process modeling, logic and timing modeling, conceptual data modeling; Project effort analysis method, designing user interfaces,

database and file design, project team organization, project management and documentation, system installation and commissioning, analysis of system maintenance and upgrading; Ethics, privacy control and security; Case study of an information system.

ICT 5208 Software Engineering and Application Development

3 credits, 3 hours/week

Software engineering paradigms, process models, complexity models, requirement engineering, different models of effort, schedule-and cost-estimation, risk analysis and management, project management, different software design methodologies, verification and validation, testing philosophy and methods, software configuration management, software metrics, software reliability and availability, software maintenance and software re-engineering, development of applications using software engineering concepts.

ICT 5209 Software Quality Management

3 credits, 3 hours/week

Software quality, software process and process metrics, different quality metrics of software; Verification and validation tasks and techniques, software error and defect removal, SQA management and models, statistical quality control; Quality management system: ISO 9000, ISO 9001, and IEEE 12207 Standards; Compliance criteria of different standards: 9000/AS-3563 and ISO 9001, Capability Maturity Model (CMM), People Capability Maturity Model (P-CMM); Benchmarking and certification.

ICT 5301 Information System and Network Security

3 credits, 3 hours/week

Fundamentals of cryptography, security for communication protocols, security for operating systems and mobile programs, and security for electronic commerce, passwords and offline attacks, DES, RSA, DSA, SHA, SSL, CBC, IPSec, SET, DDOS attacks, biometric authentication, PKI smart cards, S/MIME, privacy on the Web, viruses, security models, wireless security, and sandboxing.

ICT 5302 Advanced Internet Technologies

3 credits, 3 hours/week

Introduction to the Internet: Introduction to XML, XHTML, XSL, integrating JavaScript and XSL; Internet Address, sockets; Application specific protocols and services:

authentication, domain name services (DNS), electronic mail, world wide web, web caching, network management, internet control message protocol (ICMP), file transfer protocol (FTP), secured remote access; Voice over IP and its protocols, Next generation of internet, Revolutionary application of internet.

ICT 5303 Network Programming and Management
3 credits, 3 hours/week

Concepts of network operating system, streaming technology, inter process communication (IPC) between application programs, Abstract Syntax Notation One (ASN.1), TELNET, File Transfer Protocol (FTP), simple mail transfer protocol (SMTP), Simple Network Management Protocol (SNMP), network programming, socket-level interface, algorithm and issues in client / server software design; installation, administration and management of commercial network software packages; Network information service (NIS) and network file system (NFS); State-of-the-art network management tools and systems, high speed LAN, MAN, network management and troubleshooting techniques.

ICT 5304 Digital Communications
3 credits, 3 hours/week

Overview of different types of communication networks and their architecture; A/D conversion; GIF, JPEG, PNG; Audio coding for fixed telephone network and speech coding for mobile communications; Image and video coding: JPEG and MPEG; Channel coding: scrambling, convolution coding, cyclic redundancy checks, scrambling and interleaving; Modulation schemes: ASK, PSK, FSK, and GMSK. Modulation for local access: ADSL, DSL; Multiple access technologies, high speed PSTN access technology; Routing strategies, numbering schemes, Switching techniques: space switching, store and forward switching; Routing strategies; Numbering schemes; VSAT and satellite communication; Audio and video conferencing technique, Cable and satellite TV networks, HDTV transmission.

ICT 5305 Mobile Communications
3 credits, 3 hours/week

An introduction to ubiquitous communication; Wireless transmission: frequencies for transmission, International Regulations and Regulatory Authorities, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum; Medium access control: SDMA, FDMA, TDMA, CDMA; Radio network planning; Fundamentals of cellular telephony: concept of cellular communications, frequency reuse, cell splitting,

registration, terminal authentication, handoff; GSM and GPRS: services, system architecture, radio interface, protocols, handover, security; Next generation mobile telecommunications systems: 2.5G systems (EDGE, TETRA), 3G systems (UMTS, UTRAN), 4G and beyond; Wireless LANs and personal area networks: 802.11, IrDA, Blue-tooth, data services: WAP, mobile IP.

ICT 5306 Software and Database in Telecommunication

3 credits, 3 hours/week

Introduction to hardware and software evolution; Software components: database, distributed database, real-time software, mapping of software components etc; Constraints on the software components: real-time behavior, service continuity, hardware limitations, software and hardware integration and dimensioning etc; Telecommunication software development: examples of life cycles; Methods and tools for: requirement capture, analysis, specification, architecture, design and development; Interfaces definition: problem overview, transparency of distribution; System tests; Database in telecommunication systems, database environment, relational and object databases; Database planning, design and administration; Database trends in telecommunication: real-time database, multimedia database, WWW servers and database, 3D image handling in database, multimedia and existing RDBMS.

ICT 5307 Embedded Systems Design

3 credits, 3 hours/week

Concepts, classifications; Characteristics; Requirements; Introduction to embedded system design process, Unified Modeling Language (UML); Embedded micro-controller cores; Embedded memories; Technological aspects; Interfacing between analog and digital blocks; Signal conditioning, digital signal processing, sub-system interfacing; Interfacing with external systems, user interfacing; Design trade-offs, thermal considerations; Networked embedded systems: the I2C bus, the CAN bus, the FlexRay; Example of applications.

ICT 5308 Network Systems Design

3 credits, 3 hours/week

ICT 5308 Network Systems Design 3 credits, 3 hours/week General design process, issues, documents. LAN design: Media, devices and tools; LAN topology, star and extended star, ring, bus; Physical layout, network map, cables and conduits, labeling; Firewall. Wireless LAN: Issues and motivations; standards, IEEE 802.11; Transmission techniques: Infrared, spread spectrum and narrow band microwave; Application areas:

Extension, cross building interconnect, nomadic access, ad hoc networks; Equipments and devices. WAN design: Types and technologies; Equipments and devices; Structured design approach, considerations of design, selection and placement of devices; Evaluation of network performance, security, reliability, and management capabilities.

ICT 5309 Optical Communication

3 credits, 3 hours/week

Introduction; Light propagation through optical fiber: Ray optics theory and mode theory; Optical fibers: Structure, conditions of propagation, attenuation, pulse dispersion, fiber joint and fiber couplers; Light sources and transmitters: Principle of light emission, modulation bandwidth and spectral properties; Photodiodes and receivers: Operational principles, electrical bandwidth, noise and sensitivity; Optical amplifiers: Construction, amplification and noise; Optical communication systems with analog and digital modulation formats: performance and system budgets; Multichannel systems.